COMPOSITE PLATE

FIELD OF THE INVENTION

[0001] The present invention relates to an improvement of an inner sole configuration for protective shoes, particularly to a rigid plastic inner sole plate of a type which is penetration resistant, of thermal-insulation and of electric-insulation, for use under a special working environment.

BACKGROUND OF THE INVENTION

[0002] Protective shoes provide a relatively good protection of wearer's feet. A majority of workers who work under an environment with high risks usually wear protective shoes, in order to obtain an appropriate protection. For such a purpose, the market-available protective shoes normally have the properties of penetration resistance and crushing resistance.

[0003] Referring to Figures 9 and 10 which illustrate a configuration of the conventional shoes, a shoe sole 60 is topped with a metal inner sole plate 70 which is secured together therewith by means of a bonding process. The metal inner sole plate itself is sandwiched between two layers 61 of material, in order to obtain a better combination. A protective shoe head 71 which is made of metal material is positioned on the shoe sole 60 at a location corresponding to the wearer's toes.

[0004] Thus, the wearer's foot sole is protected by the inner sole plate 70. The metal inner sole plate 70 prevents sharp tips of an object from penetrating therethrough to injure the wearer's foot sole when the wearer's foot accidentally steps on the sharp tips of the object. The

rigid protective shoe head 71 protects the vulnerable toes from being injured even when a heavy object falls thereon.

[0005] The above described configuration of the conventional protective shoes is adapted to achieve a protective result. However, there are shortcomings in use thereof, which are discussed below.

[0006] 1. Being Relatively uncomfortable

[0007] It is difficult to fabricate in a pressing process a concave top surface of the inner sole plate 70 in accordance with bioengineering because the inner sole plate 70 is made of a metal material. The inner sole plate 70 must possess an appropriate thickness in order to achieve a result of penetration resistance, which reduces the flexibility thereof and thus the comfort of the shoe when in use.

[0008] 2. Inefficiency of Insulation

[0009] The inner sole plate 70 and the protective shoe head 71 which are both of a metal material, cannot provide effective electric shock resistance and insulation. Therefore, the conventional protective shoes are not adapted for use in an environment where electric shock resistance and thermal insulation are required.

[0010] 3. Inefficiency of Penetration Prevention

[0011] The inner sole plate 70 is substantially flat and does not form a concave surface to cover the wearer's foot sole, which results in coverage narrower than the wearer's foot sole and thus reduces the effect of penetration prevention.

[0012] 4. Inefficiency of Heat Resistance

[0013] The conventional protective shoes cannot provide an effective overall heat resistance because of the metal inner sole plate 70 and the metal protective shoe head 71, and therefore, are not adapted for use in a working environment which is extremely hot or cold.

[0014] Whereas the conventional protective shoes have the shortcomings of inefficient insulation, being uncomfortable, inefficient penetration prevention at the side margins thereof and inefficient heat resistance, I have designed an improved rigid plastic inner sole configuration which improves the shortcomings of the prior art, based on my experience of years in development and sales of shoe products, based on my study on the shortcomings of the prior art, and based on a number of improvements and test thereof. Therefore, I file this application for patent for this invention.

SUMMARY OF THE INVENTION

[0015] A primary object of the present invention is to provide an improvement of a rigid plastic inner sole configuration for protective shoes, which advantageously makes the protective shoes much more comfortable in use.

[0016] Another object of the present invention is to provide an improvement of a rigid plastic inner sole configuration for protective shoes, which significantly increases the electric shock resistance and thereby prevents the wears from being electrified.

[0017] A further object of the present invention is to provide an improvement of a rigid plastic inner sole configuration for protective shoes which provides a curved coverage of a wearer's foot sole to increase the

penetration prevention area, thereby effectively increasing the penetration prevention.

[0018] A still further object of the present invention for protective shoes, which provides an optimal effect of heat resistance and thermal insulation.

[0019] The above objects are achieved by providing an improvement of an inner sole configuration for a protective shoe in accordance with the present invention, the improvement substantially resulting from a rigid plastic inner sole plate bonded to a shoe sole of the protective shoe, and a shoe head affixed to the shoe sole in a position corresponding to the shoe wearer's toes for covering same. The improvement is particularly characterized by the following:

the rigid plastic inner sole plate being made of an electrically insulating material, including a top surface formed with a concavity for firmly contacting and supporting a wearer's foot sole, a bottom surface having a curved configuration at a periphery thereof, the rigid plastic inner sole plate further including first, second and third plate bodies positioned in a longitudinal sequence in correspondence to a shape of the wearer's foot sole;

the first plate body including a connecting portion having a recess at an end of the first plate body adjacent to the second plate body, the second plate body including a first connecting portion having an extension at a first end of the second plate body corresponding to the connecting portion of the first plate body, a predetermined clearance being defined in the top surface of the plate between an end of the recess and an end of the extension, and a pair

of predetermined spaces being defined in the bottom surface of the plate at respective side margins thereof, each space between the connecting portion of the first plate body and the first connecting portion of the second plate body, and the two connecting portions contacting each other at a middle portion thereof; and

the second plate body including a second connecting portion having a recess at a second end of the second plate body opposite to the first end thereof, the third plate body including a connecting portion having a extension at a first end of the third plate body adjacent to the second plate body, a predetermine clearance being defined in the top surface between an end of the recess and an end of the extension, and a pair of predetermined spaces being defined in the bottom surface of the plate at respective side margins thereof, each space between the second connecting portion of the second plate body and the connecting portion of the third plate body, and the two connecting portions contacting each other at a middle portion thereof, thus the first, second and third plate bodies thereby being pivotal with respect to the one adjacent thereto to conform with a bending movement of the wearer's foot sole, the third plate body further including a recess formed in a lower part of a second end thereof opposite to the first end thereof for engaging a rim of a rigid plastic shoe head.

[0020] The connecting portion of the first plate body, the first and second connecting portions of the second plate body and the connecting portion of the third plate body advantageously comprise a laterally extending rounded bottom end surface, respectively.

[0021] Preferably, the rigid plastic inner sole plate and the shoe head are made of thermosetting resin with reinforcing fibers.

[0022] Preferably, the shoe head is a metal product.

[0023] A preferable embodiment of the present invention is described below, with reference to the accompanying drawings by way of illustration, in order to enable people skilled in the art to work the present invention according to the teachings of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Figure 1 is a schematic exploded perspective view of a rigid plastic inner sole plate according to the present invention;

[0025] Figure 2 is a cross-sectional view of a protective shoe according to the present invention;

[0026] Figure 3 is a top plan view of the rigid plastic inner sole plate of the present invention;

[0027] Figure 4 is a bottom plan view of the rigid plastic inner sole plate of the present invention;

[0028] Figure 5 is a cross-sectional view, taken along line 5-5 of Figure 3;

[0029] Figure 6 is a cross-sectional view, taken along line 6-6 of Figure 3;

[0030] Figure 7 is a view, in an enlarged scale, of the circled portion in Figure 5;

[0031] Figure 8 is a schematic illustration, showing the rigid plastic inner sole plate of the present invention under a bending condition;

[0032] Figure 9 is a schematic exploded perspective view of a conventional protective shoe; and

[0033] Figure 10 is a schematic cross-sectional view of the conventional protective sole.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0034] Referring to Figures 1-7, the present invention relates to an improvement of an inner sole configuration for protective shoes in which a rigid plastic inner sole plate 1 is bonded to a rubber shoe sole 50. A layer 51 of a material is bonded to each of the top and bottom surfaces of the rigid plastic inner sole plate 1. A shoe head 40 (as shown in Figure 2) is affixed to the shoe sole 50 in a position corresponding to the shoe wearer's toes for covering same.

[0035] In this configuration the rigid plastic inner sole plate 1 and the shoe head 40 are made of thermosetting resin with reinforcing fibers. The shoe head 40 however can also be a metal product. The rigid plastic inner sole plate 1 is configured with first, second and third plate bodies 10, 20 and 30 positioned in a longitudinal sequence in correspondence with the positions of bendable portions of the wearer's foot sole where the foot joints are located. The plate 1 includes a top surface with a concavity 100 (as shown in Fig. 6) according to bioengineering, thereby being adapted for supporting the wearer's foot sole. The plate 1 includes a bottom surface having a curved configuration 101 at the periphery thereof.

[0036] The first plate body 10 includes a connecting portion 11 at an end thereof adjacent to second plate body 20. The connecting portion 11 defines at an upper part thereof a recess 110 extending laterally therethrough and defines at a lower part thereof a rounded bottom end surface 111 (as shown in Fig. 5).

[0037] The second plate body 20 includes a first connecting portion 21 at a first end thereof adjacent to the first plate body 10. The first connecting portion 21 has an extension 210 extending from an upper part thereof. The extension 210 is enabled to rest in the recess 110 of the first plate body 10. A clearance is formed between an end of the recess 110 of the first plate body 10 and an end of extension 210. The first connecting portion 21 further includes a laterally extending rounded bottom end surface 211 (as shown in Fig. 5). The second plate body 20 includes a second connecting portion 22 at a second end thereof opposite to the first end thereof. The connecting portion 22 includes a recess 220 formed at an upper part and extending laterally therethrough, and a laterally extending rounded bottom end surface 221 (as shown in Figs. 1 and 5). An appropriate space is formed at each of the opposite side margins of the plate 1 between a lower part of the connecting portion 11 of the first plate body 10 and a lower part of the connecting portion 21 of the second plate body 20. The connecting portion 11 and 21 contact each other at a middle part thereof between the opposite side margins.

[0038] The third plate body 30 includes a connecting portion 31 at first end thereof toward the second plate body 20. The connecting portion 31 has an extension 310 extending from an upper part thereof which is enabled to

rest in the recess 220 of the second plate body 20. A clearance is formed between an end of the recess 220 of the second plate body 20 and an end of the extension 310. An appropriate space is formed at each of opposite side margins of the plate 1 between a lower part of the second connecting portion 22 of the second plate body 20 and a lower part of the connecting portion 31 of the third plate body 30. The connecting portion 22 and 31 contact each other at a middle part between the opposite side margins. Furthermore, the connecting portion 31 includes a laterally extending rounded bottom end surface 311 (as shown in Figure 5 and 7). Thus, the first and second plate bodies 10, 20 are enabled to bend freely.

[0039] The third plated body 30 further includes a recess 32 formed in a lower part of a second end thereof opposite to the first end thereof for engaging a rim of a rigid plastic shoe head.

[0040] In such a configuration according to the present invention, the rigid plastic inner sole plate 1 benefits from the rigidity and solidity of the insulating plastic material, provides an optimal overall result of electric shock resistance, heat resistance and thermal insulation, and thereby improves the insulation safety of the protective shoes. Additionally, the rigid plastic inner sole plate 1 provides the protection of the wearer's foot sole from injury resulting from sharp tips of an object penetrating the rubber shoe sole 50 of the protective shoes.

[0041] The rigid plastic inner sole plate 1 of the present invention has a concavity 100 on the top surface thereof which is better fitted to the wearer's foot soles, thereby providing a better coverage and support for the wearer's

foot soles, and thus improving the comfort of the protective shoes. Also because of the concavity 100, the rigid plastic inner sole plate 1 is enabled to extend to the opposite side areas of the wearer's foot soles, forming a larger coverage for the wearer's foot soles. When a sharp tip of an object penetrates the shoe sole of the protective shoe at the side margins thereof, and then contacts the curved configuration 101 at the periphery of the plate 1, the sharp tip will be forced and guided to project laterally and outwardly, thereby being prevented from injuring the wearer's foot sole. Therefore, the safety of the protective shoes regarding penetration prevention is significantly improved.

[0042] Furthermore, in accordance with the bendable areas of the wearer's foot sole at the joints thereof, the rigid plastic inner sole plate 1 of the present invention includes the first, second and third plate bodies 10, 20 and 30 which connect to one another, and the plate 1 defines an appropriate space respectively between the connecting portions 11, 21 of the respective first and second plate bodies 10 and 20, between the connecting portions 22, 31 of the respective second and third plate bodies 20 and 30. Thus, the first, second and third plate bodies 10, 20 and 30 are freely bendable such that the respective plate bodies are enabled to bend corresponding to various bending directions of the wearer's foot sole joints (as shown in Figure 8). The wearer's foot movement will not thus be restricted by the protective shoe, and the wear will thus feel much more comfortable.

[0043] Conclusively, in contrast to the soles of the conventional protective shoes, the improvement of the rigid plastic inner sole configuration of the present invention

results in much better safety and comfort of the protective shoes when in use. The technical approach of the present invention has not been disclosed in the relevant publication, and thus satisfies the requirements for utility patent applications. In accordance with the Law, therefore, this application is submitted, and the patent rights for the present invention are respectfully requested.